

# LAND SURVEY AND ASSESSMENT FOR RELOCATION

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**ABSTRACT:** The Construction and Planning Agency, Ministry of the Interior, called for the meeting of “Proper village relocation in response to the ‘Efforts of August 8 Flood Rescue and Reconstruction’” on Aug 19 2009 to confirm the subsequent house reconstruction operations and the activation of initial survey procedure of permanent relocation sites. The “site safety survey group” was established immediately after the meeting to start the safety evaluation and survey of the sites of permanent relocation. The group consisted of experts from central competent authorities, professional engineering associations and universities (those who are specialized in civil engineering, water resources, geology, water and soil conservation, and environmental protection), and representatives from local governments (city/county governments and township offices), charity groups (NGOs), local reconstruction shareholders and the public. The group was gathered to perform the initial survey of these permanent sites and help the government accelerate the reconstruction progress.

The permanent relocation sites to be surveyed were government lands, state-owned properties and abandoned school lands owned or operated by local governments, military lands not in use or lands owned by Taiwan Sugar Corporation. The lands recommended by the Council of Indigenous Peoples, Executive Yuan were given higher priorities. For the surveyed sites, the maps of “limited development areas” and “disaster potential areas” and the “strategic reconstruction zoning” charts approved by the Executive Yuan were developed for limited development analysis, and the result was provided to the survey group for the knowledge and diagnosis of areas surrounding the sites. The accounts of the locals were added to the evaluation and judgment. On the completion of the surveys, the survey records were collected and the statistics and evaluation results were compiled into a site survey overview, which was integrated with the comments provided in the records and by the experts for the reference of the site development. The sites that were evaluated as appropriate were given to local governments on the list of reserve sites for permanent relocation.

From Aug 20 2009 to Sep 30 2010, 145 sites that met the strategic reconstruction zoning” were surveyed, and 77 were selected as appropriate sites for relocation. 102 experts in total were invited for the surveys. The survey results were provided to local governments for the selection of post-disaster residence relocation.

**KEYWORDS:** Permanent Relocation, Reserve Site, Development-restricted Area

## 1. INTRODUCTION

Typhoon Morakot is the deadliest typhoon to impact Taiwan for last 50 years. It hit Taiwan on August 7 2009 and the rainfall was a record-breaking of 2,900 millimeters in 3 days, pouring around the central, the southern Taiwan and eastern mountain area. That caused the worst flooding and so as large-scale landslides disasters, and resulted in village Xiaolin entirely buried, hundreds of buildings washed away, thousands of residents homeless. Relocation is eventually the centre issue to the post-disaster reconstruction projects.

Construction and Planning Agency, Ministry of the Interior called a meeting 12 days after Morakot hit Taiwan to discuss post-disaster reconstruction projects on the mechanism of processes and procedures for housing reconstruction, and to activate the first stage permanently relocation sites survey and assessment. "Location Safety Assessment Team" was set up for this mission to survey and assess the safety of relocation sites and suggest appropriate alternatives for local governments to promote post-disaster housing placement. Figure 1 illustrates the process of the land assessment and details are discussed in the following section.

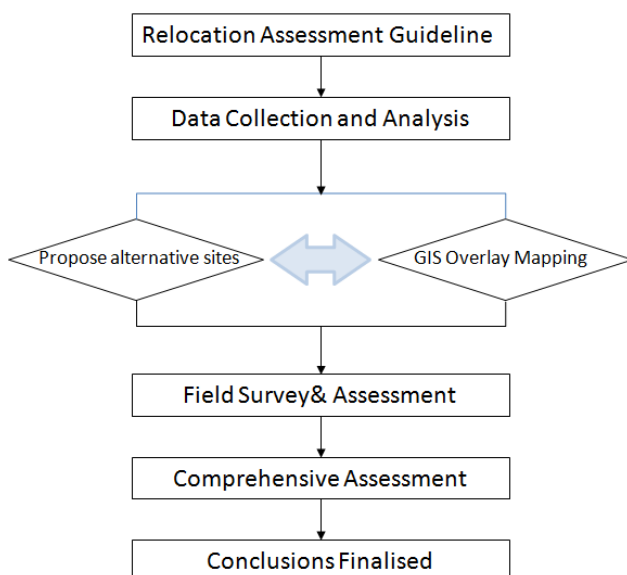


Figure 1 sites assessment process and procedure

## 2. GUIDELINE FOR RELOCATION SITES ASSESSMENT

The primary guideline for relocation sites assessment is as the following:

1. Sites with the advantage of socio-economic and livability are priority options for permanent resettlement.
2. Sites of natural environment insecurity/sensitivity are excluded.
3. Comprehensive field assessment by licensed experts, university scholars and people from local community is required.
4. The site will finally be suggested one of three classes, "suitable", "not suitable" or "reserved" for permanent relocation that provide useful information for local governments in speeding up the process of post-disaster reconstruction.

## 3. SITE ALTERNATIVES FOR RELOCATION

Three types of sites are prior to be permanent relocation alternatives. The first is that land ownership of public, state-owned enterprise or land abandoned such as school grounds or military camp. The second is the land that city/county local governments consider emergence relocation required and the site is high infrastructure and livability supported. The third is locations suggested by Council of Indigenous Peoples for relocating indigenous groups.

Based on the principle of the priority, the local government authority will propose the alternative of relocation site for village damaged by the disaster.

## 4. OVERLAY ANALYSIS

In this stage, land regulations of the proposed site were checked using GIS map overlay technology. Three categories of maps referring three level of land regulation control for different land uses were taken into account, which were "development-restricted areas", "potential disaster areas" and "strategic

reconstruction zone” by the approval of Executive Yuan. Those maps associated with high resolution aerial photograph or Google earth/map provided information to establish background information and detail of nature environment of site alternatives.

#### 4.1 Development-restricted area

In the second overall review of Middle-Taiwan Regional Planning, development-restricted areas (DRA) were designated with consideration of 19 environment sensitivity factors. The factors were classified into four categories of ecosystem, cultural landscape, nature resources and nature disaster sensitivity. Table 1 listed the composition details including relevant acts referenced and the authorities of the act in the level of state government.

Figure 1 illustrated environment sensitive factors of potential debris flow, active faults and potential hill-slide area according to legend’s color and symbol. Area of red-line is the relocation site and DRA is on its right-hand side. It is not supposed to have any overlay with relocation area and DRA due to the environment sensitivity.



Figure 1 Development-restricted map of Wulipo village, Chia-hsien Kaohsiung

#### 4.2 Potential disaster area

The site within potential disaster area is also excluded from lists of relocation site alternatives. There are three maps taken into account: map of potential debris flow torrent where disaster threat is middle or high, hillside disaster including landslides, earth slide and dip slopes etc. and flood-prone area.

#### 4.3 Strategic reconstruction area

Be aware that global climate change might produce an increase in the frequency and intensity of tropical cyclones, Regional Reconstruction Master Plan, proposed by Council for Economic Planning and approved by the Executive Yuan on October 9, has addressed the premise of national land conservation that the implementation of reconstruction has to base on the ideal of protecting and restoring the national land.

Being with the policy guideline under the premise of conserving national land, the Regional Reconstruction Master Plan concluded four aspects of land, ecological resources, landscape resources, soil & water resources conservation and disaster susceptibility to integrated relevant institution legality regulations and research results to establish a land suitability analysis framework for identifying three classes of strategic reconstruction zones, which are Strategic Reconstruction Zone1, Zone2 with 2A and 2B two sub-classes, and Zone3.

In accordance with No.0980004264 document the Council for Economic Planning on September 9, 1998, the site selection for relocation should avoid environment sensitive areas, particularly Strategic Reconstruction Zone1 and 2A. The category of the class is discussed as following:

1. Strategic Reconstruction Zone1 is the area where land authorities of all level government demarcate to development forbidden or disaster danger area announced in accordance with the Morakot Post-Disaster Reconstruction Special

Act enacted on August 28, 2009. A list of forbidden area is shown as follow:

- ecological protected area, scenic area and Cultural/historic area of national parks by Act of National Parks.
- wildlife refuge area and major wildlife habitats by Act of Wildlife Conservation
- nature reservation area by Act of Cultural Heritage Preservation Law
- nature reservation area of State-owned forests (including university experimental woodland and forestry experimental forest), landscape protection area of forest recreation parks and forest ecosystem conservation areas of conservation forests by Forest Act
- the scope of the drinking water source quality protection area and the certain distance from drinking water intake points, designated by Act of Drinking Water Management
- the storage and catchment area of Reservoir by Water Act
- river area, first-degree regulated flooding area and flood plain by Water Act
- designated soil and water conservation area by Act of Soil and Water Conservation
- The disaster danger areas announced after the designated inspection committee by Post-disaster Reconstruction Special Act of Typhoon Morakot

This zone in principle is no development allowed and shall have continuously improved the achievement in environment conservation and ecosystem protection. But if exceptions is listed the requirement of public facilities, public utilities, facilities of military defense and facilities for eco-protection, environment impact evaluation will be required and to be examined to get approval licenses.

2. Strategic Reconstruction Zone2 is development restricted area delineated according to land authorities administration or the project/plan

approved by the Executive Yuan. A list of restricted development area is illustrated as follow:

- water quality and quantity of protection areas by Water Supply Act
- hillside slopeland by Enforcement Rules of Slope Land Conservation and Utilization Act
- major Reservoir catchment area by Regional Planning Act
- mineral concession(terrain), mine reservation area, underground mines tunnel area by Mining Act
- severe land subsidence areas by Land Subsidence prevention executive program
- coastal nature reservation area, general protection areas by Nature Environment Protection Project of Taiwan Coastal Area
- active faults area by Buildings Management Regulations in the area of regional plans

Zone2 has two sub-classes Zone2A and Zone2B. Disaster factors applied to this zonal scheme are illustrated in Table 2 as below.

Table 2 Factors for classifying Zone2A and 2B	
Potential Environment Disasters Area	Designated Authority
<b>Zone2A</b>	
High and medium landslide susceptibility area	Central Geological Survey, Ministry of Economic Affairs
<b>Low river terraces</b>	
High and medium impact area of potential debris flow torrent	Soil and Water Conservation Bureau of Council of Agriculture
Flood plain	Water Resources Agency, Ministry of Economic Affairs
Dike erosion	Ministry of Economic Affairs
<b>Zone2B</b>	
low landslide susceptibility area	Central Geological Survey, Ministry of Economic Affairs
Low impact area of potential debris flow torrent	Soil and Water Conservation Bureau of Council of Agriculture

3. Strategic Reconstruction Zone3 is area neither categorized as Zone1 nor Zone2.

There were 15 areas server damaged by Typhoon Morakot. All those sites were designated as reconstruction area and categorized into one of the four classes introduced in this section. Figure 2 shows the location and the spatial distribution of the 15 areas.

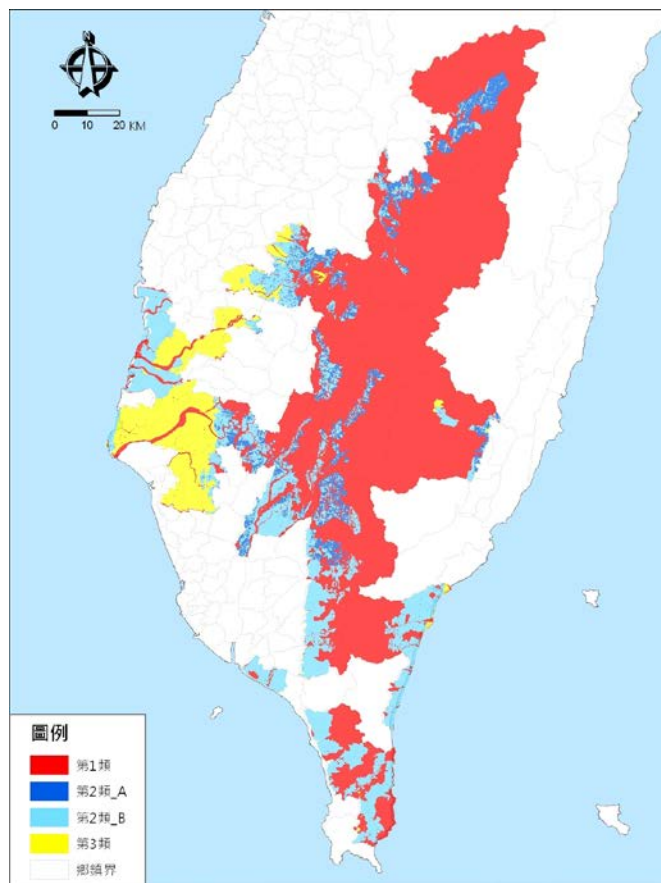


Figure 2 Strategic Reconstruction Zone map

#### 4.4 Factors of liveability

In addition to the security issues of relocation sites, factors related to liveability is also critical in reestablishing new lives for disaster's victims. Mobility and accessibility directly form relocation communities that high liveability supported area is high success likelihood. To this concern, factors relates to liveability supports in terms of people's livelihood, infrastructure, industry, living area of the maintenance of culture inheritance and continuity are collected, measured and analyzed.

## 5. FIELD SURVEY/ASSESSMENT

### 5.1 Safety assessment task groups

Considering the assessment to cover a broad range of reconstruction issues, safety assessment task groups were set up with the participation of authority officers, expertises and inhabitants. Authorities of central and local government agencies included NCDR, the Central Geological Survey, Ministry of Economic Affairs and its Water Resources Agency, the Environmental Protection Administration, Council of Agriculture and its Water Conservation Bureau, Forestry Bureau, Council of Indigenous Peoples. Professional expertises included professors from university or other academic institutions, professional engineers societies and consulting firms. Inhabitant included residence representatives for reconstruction projects, volunteers and NGOs

### 5.2 Field survey and assessment

Due to the Strategic Reconstruction Zone1, Zone2A are high environment sensitivity and rigid in regulation control, Zone2B and Zone3 were the priority for the alternative sits of relocation construction.

Factors should be taken into account in relocation sites assessment are numerous. Major aspects covered an overall field review in damage conditions of infrastructure and environment, the vulnerability of the area, public utilities conditions, the availability of resources, land uses and social considerations. It was also important to participate with local people to help explaining the base surrounding and the development of the site during the field survey. Check Table 3 for the photo records of field survey and assessment on 12 alternative sites.

After the field works, the group will have a brief discussion to clarify and confirm key factors to be concerned. On an individual base, each of the group

member finishes the form of “Morakot post-disaster housing reconstruction site evaluation” (see figure 3 for the form), in which individual’s assessment on background and location condition of sites is given and to tick on the one of three overall comments if the site is “suitable for relocation”, “not suitable for relocation” or “further investigation required”.

**莫拉克颱風災後住宅重建地點現勘評估表**

評估地點： \_\_\_\_\_ 評估日期： \_\_\_\_\_

評估者： \_\_\_\_\_ 聯絡電話： \_\_\_\_\_

評估項目	適宜性評估			評估說明
	很適合	普通	不適合	
<b>一、基本資料</b>				
1. 所有權 (公有、私有)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. 基地面積 (公頃)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. 地塊完整性	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. 基地現況使用	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. 禁、限建管制	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>二、區位評估</b>				
<b>1. 居住安全性</b>				
■ 地質 (含斷層、順向坡)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
■ 坡度 (含邊坡穩定性)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
■ 淹水潛勢 (含河岸侵蝕)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
■ 土石流	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
■ 氣候影響 (風力...)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. 生活機能 (市場、醫院、學校、鄉鎮公所...)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. 聯外交通	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. 基礎設施 (水、電...)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>初審意見</b>				
綜合評估	<input type="checkbox"/> 可作為安置地點 <input type="checkbox"/> 不宜作為安置地點 <input type="checkbox"/> 應再做.....調查後再評估			

Figure 3 Morakot post-disaster housing reconstruction site evaluation form.

Collecting the evaluation forms by the participant of the safety assessment task group, the authority agency for the land assessment summarizes the statistics of every items of the form and compact the open opinions to accomplish the “Morakot post-disaster housing reconstruction site synthetic comment form” (see figure 4). In which, the synthetic assessment of the alternative will be marked as one of the following comments: appropriate(可), not adequate(不宜), preserve(保留) and remain blank(未填寫). The assessment fully record all the comments and suggestions of each alternative site to be the reference of further the development or construction projects. Nonetheless,

the development or construction in implementation stage, local county and city governments shall follow the process and procedure by “Regulations on Altering and Developing for the Settled Areas of the Typhoon Morakot Disaster Victims.

莫拉克颱風災後住宅重建地點現勘評估綜整表

評估地點： \_\_\_\_\_ 評估日期： \_\_\_\_\_

評估項目	適宜性評估			未填寫	評估說明
	很適合	普通	不適合		
一 居住安全性					
1. 地質 (含斷層、順向坡)					
2 坡度 (含邊坡穩定性)					
3. 淹水潛勢 (含河岸侵蝕)					
4. 土石流					
5. 氣候影響 (風力...)					
二 生活機能 (市場、醫院、學校、鄉鎮公所...)					
三 聯外交通					
四 基礎設施 (水、電...)					
五 其它意見					
綜合評估	可	不宜	保留	未填寫	保留之意見

Figure 4 Morakot post-disaster housing reconstruction site synthetic comment form

## 6. THE IMPLEMENTATION OF RESULTS

The field survey and assessment had completed investigation on 145 selected sites, in which a total of 77 sites was concluded appropriate for relocation. In respect to the participation, 102 experts was invited to join the survey and to contribute their expertise for disaster recovery works on a broadly wide range of field works. The results was also delivered to authority agency of local government to take charge the aftercoming stage of disaster recovery.

## 7. REFERENCE

1. 行政院 98 年 10 月 9 日院臺經字第 0980060508A 號函核定「以國土保育為先之區域重建綱要計畫」
2. 台灣中部區域計畫(第二次通盤檢討)規劃草案

Table 1 the category of sensitive area

Category	Types of development restricted areas (DRA)	Acts DRA referenced	The authorities of State Government
ecological sensitivity	1.scenic area and ecological protected area of national parks	National Parks Act	Ministry of the Interior
	2.nature reservation area	Cultural Heritage Preservation Act	Council of Agriculture
	3.wildlife refuge area	Wildlife Conservation Act	Council of Agriculture
	4.major wildlife habitats	Wildlife Conservation Act	Council of Agriculture
	5. nature reserve area	Act for the establishment and management of nature reserve area (Forest Law)	Council of Agriculture
	6. coastal nature reserve zone	Regional Planning Act, Conservation Plan of Preserving Nature Environment of Taiwan Coastal Area approved by the Executive Yuan	Ministry of the Interior
cultural landscape sensitivity	7. Monuments preservation areas	Cultural Heritage Preservation Act	Council for Cultural Affairs
	8. Historical Sites	Cultural Heritage Preservation Act	Council for Cultural Affairs
	9. Cultural/historic area of national parks	National Parks Act	Ministry of the Interior
nature resources sensitivity	10.the scope of the drinking water source quality protection area and the certain distance from drinking water intake points	Drinking Water Management Act	Environmental Protection Administration
	11.important reservoir catchment areas	Regional Planning Act	Ministry of the Interior (Ministry of Economic Affairs to assist identified Announcement)
	12. the storage and catchment area of Reservoir	Water Act	Ministry of Economic Affairs
	13.forest area designated by the forest areas of the state-owned forest, conservation forest, university experiment woodland and forestry experimental forest and regional planning	Forest Act	Council of Agriculture Ministry of the Interior
	14. hot spring outcrop and the certain distance from it	Hot Spring Act	Ministry of Economic Affairs
natural disasters	15.hillside assessed to be enhance conservation area	Utilization and Transfer of Reserved Mountainous Land	Council of Agriculture

sensitivity	16.buffer zone of active faults	Buildings Management Regulations in the area of regional plans ( Based on the active faults map announced by the Central Geological Survey MOEA	Ministry of Economic Affairs (MOEA)
	17. designated soil and water conservation area	Soil and Water Conservation Act	Council of Agriculture
	18.river area, first-degree regulated flooding area and flood plain	Water Act, River Management Regulations	Ministry of Economic Affairs (MOEA)
Others	19. development and construction prohibited areas legally designated	-	-

Source: compiled by this study



Table 3 Photo Gallery of Safety Land Field Survey/ Assessment

<p>The Yuehmei Ranch, Kaohsiung</p>	<p>Abandoned Jiou-Peng Primary School , Manjhou Pingtung</p>	<p>idle accommodation, Shui-Li station, Forestry Bureau Nantou</p>
		
<p>The site close to Da-Niao primary school, Taitung</p>	<p>Shin-Fu community, Taitung</p>	<p>Ma-Jia farms, Pingtung</p>
		
<p>Forest land No.30 and No.67-3, HsinYi, Nantou</p>	<p>Ssu-Lin Farm, Pingtung</p>	<p>DungHaiFeng Farm, TSC. Pintung</p>
		
<p>No.763 KaoShih section of Mudan, Pentung</p>	<p>Forest land No.25 Mudan, Pentung</p>	<p>Village Wulipo, ChiaHsien Kaohsiung</p>
		